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10/531,634	11/17/2005	Jae-Ho Jung	51876P840	6230

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EXAMINER	
MALEK, LEILA	

ART UNIT	PAPER NUMBER
2611	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/531,634	JUNG ET AL.	
	Examiner	Art Unit	
	LEILA MALEK	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 March 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,4,6,7 and 10* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4,6,7, and 10* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *02 July 2007* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed on 03/10/2010 have been fully considered but they are not persuasive.

Applicant's argument: Applicant argues that the rejection of claims 1, 2, 4, 6, 7, and 10 under 35 U.S.C. 112, first paragraph is not proper, because the specification as originally filled complies with the enablement requirement.

Examiner's Response: Examiner respectfully disagrees. Examiner understands that it is desirable to maintain the transfer function of each channel within a threshold, however it is not clear how the transfer function of each channel is maintained within a predetermined variation period by setting the first updating period to be faster than the second updating period. Regarding this limitation, Applicant only repeats the language of the in the specification and no further details have been provided.

Applicant's argument: Applicant argues that Background of invention and Posti fail to disclose limitation "array linearization means that uses the same feedback path as the array error compensation means"

Examiner's Answer: Examiner states that the combination of Applicant's background of invention and Posti does not disclose that the array linearization means uses the same feedback path as the array error compensation means. However, the array linearizer (according to Posti) and the error compensation coefficient estimator (according to Applicant's background of invention) both need to receive the output of the downconverter, and the down-converters disclosed by Applicant's background of

invention and Posti have only one output, therefore it would have been clearly recognizable to one of ordinary skill in the art at the time of invention that these components should use the same feedback when the teaching of Posti has been incorporated in the system disclosed in the background of invention.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 1, 2, 4, 6, 7, and 10 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. As to claims 1 and 6, Applicant in invention's disclosure fails to disclose how the transfer function of each channel is maintained within a predetermined variation period by setting the first updating period to be faster than the second updating period, in a way to enable one skilled in the art to use the same method. Regarding this limitation, Applicant only repeats the language of the in the specification and no further details have been provided. Claims 2, 4, 7, and 10 depend on claims 1 and 6, respectively; therefore they are rejected as well.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1, 2, 4, 6, 7, and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over background of invention further in view of Posti (US 2002/0021764).

As to claim 1, Applicants in the background of invention disclose an adaptive array antenna system (see Fig. 1), comprising: modulation mean 101 having a plurality of modulators for generating transmitting data corresponding to the number of users (see page 6, lines 36-37 - page 7, line 1); beam forming means 102 (see page 7, line 1-4) having a plurality of beam formers for generating a multiplexed data by multiplexing the generated transmitting data to a beam forming weight; vector addition means 103 for generating sum data by adding outputs of the beam forming means corresponding to a user (see page 7, lines 5-8); array error compensation means 108 for generating an error compensation coefficient of each channel (see block 106 and page 7, lines 32-37) and error compensated data, the array error compensation means multiplexing a reverse of a transfer function of an array transmitting means to the sum data from the vector addition means 103 (see page 7, lines 8-10) by using a compensation signal inputted through a frequency down conversion means 114 on a feedback path; compensation signal extraction means 113 for extracting the compensation signal from an output signal of the array transmitting means 110 and outputting the compensation signal; the frequency down-conversion means 114 for generating the frequency down converted signal by frequency-down converting the compensation signal; the array transmitting means 110 for converting the signal from the array error compensation

means to an analogue signal and frequency-up converting the analogue signal (see page 7, lines 10-13); and array antenna means 115 for transmitting an output signal passed through the compensation signal extraction means 113. Applicants in the background of invention disclose all the subject matters claimed in claim 1, except for array linearization means that uses the same feedback path as the array error compensation means for receiving the error compensated data from the array error compensation means, generating linearized signal by linearizing the error compensated data by using frequency down converted signal from the frequency down conversion means and transferring the linearized signal to the transmitting means, wherein the array linearization means includes non-linear coefficient estimation means for receiving an output signal of the array error compensation means, comparing the output signal and the frequency down converted signal form the frequency down conversion means and estimating a non-linear coefficient for each channel, and pre-distortion means for linearizing the error compensated data from the array error compensation means by multiplexing the estimated non-linear coefficient with the error compensated data. Applicants in the background of invention also do not disclose that the array error compensator means sets a first updating period for updating the error compensation coefficient, and the array linearizer means sets a second updating period for updating the estimated non-linear coefficient. In view of 35 U.S.C. 112, first paragraph no patentable weight has been given to limitation "wherein the transfer function of each channel is maintained within a predetermined variation period by setting the first updating period to be faster than the second updating period". Posti, in the same field of

endeavor, shows a communication system (see Fig. 4) comprising: an array linearization means (see block 108) for receiving an input data signal (see the output of blocks 106) and generating linearized signal by linearizing the data by using frequency down converted signal (i.e. the output of channeliser 140, see also downconverter 132) from the frequency down conversion means (see downconverter 132) and transferring the linearized signal to transmitting means (see antenna 126), wherein the array linearization means includes non-linear coefficient estimation means (see Fig. 7, subtractors 202) for receiving an output signal of the modulators 106, comparing the output signal and the frequency down converted signal (see the output of channeliser 140, as explained above) form the frequency down conversion means (see multiplier 132) and estimating a non-linear coefficient for each channel (see the outputs of 202s), and pre-distortion means for linearizing the modulated data by multiplexing the estimated non-linear coefficient with the modulated data (see paragraph 0039). It would have been obvious to one of ordinary skill in the art at the time of invention to modify Applicants' background of invention as suggested by Posti and include an array linearization means in the system to correct the amplification distortion caused by the amplifier in the transmit path (see paragraphs 0001-0012). Posti further discloses that the non-linear coefficients in the array linearizer have been updated (see paragraph 0050). Posti does not expressly disclose a period for this update. However, inherently there is always a period associated with updates, which indicates how often the coefficients should be updated. Posti does not expressly disclose that the array linearization means (predistorter 108) receives the error compensated signal instead of

the data signal; however since the purpose of using a pre-distorter in transmitter is only to correct the amplification distortion caused by the RF power amplifier, the position (or location) of pre-distorter in the transmitter is a matter of design choice. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to combine the teachings of Applicants in the background of invention with Posti's teachings and place the pre-distorter for instance immediately after the array error compensator to meet the design requirements of the system. The combination of Applicant's background of invention and Posti does not disclose that the array linearization means uses the same feedback path as the array error compensation means. However, the array linearizer (according to Posti) and the error compensation coefficient estimator (according to Applicant's background of invention) both need to receive the output of the downconverter, and the down-converters disclosed by Applicant's background of invention and Posti have only one output, therefore it would have been clearly recognizable to one of ordinary skill in the art at the time of invention that these components should use the same feedback when the teaching of Posti has been incorporated in the system disclosed in the background of invention. Applicants' background of invention also does not disclose updating the error compensation coefficients. However, based on Posti's teaching (see paragraph 0050), it would have been obvious to one of ordinary skill in the art at the time of invention to update the error compensation coefficients to ensure that the error has been fully and properly compensated through all the channels. The combination of Applicants' background of invention and Posti does not disclose that there is a period associated with updates of

error compensation coefficient. However, as explained above, there is always a period associated with updates, which shows how often the coefficients should be updated.

As to claim 2, Applicants in the background of invention further disclose that the array error compensation means 108 includes: error compensation signal generation means 104 for generating a digital error compensation signal to be injected to a channel in order to estimate the transfer function of the array transmitting means; error compensation signal injection 105 for generating digital transmitting data by adding an output vector of the vector addition means 103 and a vector of the digital error compensation signal vector; error compensation coefficient estimation means 106 for estimating the error compensation coefficient of each channel by considering relation between the compensation signal from the frequency down conversion means 114 and the error compensated signal generated from the error compensation signal generation means 104; and error compensation means 107 for multiplexing a reverse of the error compensation coefficient to the digital transmitting data (see page 7, lines 8-10) generated from the error compensation signal injection means 105 in each transmitting channel of the array transmitting means 110 and transferring a result of the multiplexing to the array transmitter means.

As to claim 6, Applicants in the background of invention disclose a linearization method comprising the steps of: generating a transmitting signal corresponding to a number of users (see Fig. 1, block 101 ,and page 6 last paragraph); generating multiplexed data by multiplexing the transmitting data with a beam forming weight (see beam-formers 102 and page 7, lines 104); c) generating sum data (see 103) by adding

the multiplexed data; d) generating an error compensation coefficient of each channel (see block 106 and page 7, last paragraph) and error compensated data (see block 107), the error compensated data being generated by compensating a frequency down converted signal received from a feedback path (see the output of block 114), the frequency down converted signal being the transmitting signal that passes through a frequency down converter. Applicants in the background of invention disclose all the subject matters claimed in claim 6, except for receiving the error compensated data from the step d), comparing the error compensated data and the frequency down converted signal on the same feedback path and estimating a non-linear coefficient of each channel; and linearizing the error compensated data from the step d) by multiplexing the estimated non-linear coefficient of each channel with the error compensated data wherein a first updating period is set for updating the error compensation coefficient, and a second updating period is set for updating the estimated non-linear coefficient. In view of 35 U.S.C. 112, first paragraph no patentable weight has been given to limitation "wherein the transfer function of each channel is maintained within a pre-determined variation period by setting the first updating period to be faster than the second updating period". Posti, in the same filed of endeavor, discloses a linearization method comprising the steps of: receiving an input data signal (see Fig. 7, block 108a, subtractors 202), comparing the input data signal and a frequency down converted signal (see Fig. 4, units 132, 140, and 108) and estimating a non-linear coefficient of each channel (see Fig. 7, the outputs of subtractors); and linearizing the input data by multiplexing the estimated non-linear coefficient of each

channel with input data signal (see paragraph 0039). It would have been obvious to one of ordinary skill in the art at the time of invention to modify Applicants' background of invention as suggested by Posti and include a linearizer in the system to correct the amplification distortion caused by the amplifier in the transmit path (see paragraphs 0001-0012). Posti does not expressly disclose using the error compensated signal instead of input data signal to generate non-linear coefficients; however since the purpose of using a pre-distorter in transmitter is only to correct the amplification distortion caused by the RF power amplifier, the position (or location) of pre-distorter in the transmitter is a matter of design choice. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to combine the teachings of Applicants in the background of invention with Posti's teachings and place the pre-distorter for instance immediately after the error compensator to meet the design requirements of the system. The combination of Applicant's background of invention and Posti does not disclose that the array linearization means uses the same feedback path as the array error compensation means. However, the array linearizer (according to Posti) and the error compensation coefficient estimator (according to Applicant's background of invention) both need to receive the output of the downconverter, and the down-converters disclosed by Applicant's background of invention and Posti have only one output, therefore it would have been clearly recognizable to one of ordinary skill in the art at the time of invention that these components should use the same feedback when the teaching of Posti has been incorporated in the system disclosed in the background of invention. Posti further discloses that the non-linear coefficients in the

array linearizer have been updated (see paragraph 0050). Posti does not expressly disclose a period for this update. However, inherently there is always a period associated with updates, which indicates how often the coefficients should be updated. Applicants' background of invention also does not disclose updating the error compensation coefficients. However, based on Posti's teaching (see paragraph 0050), it would have been obvious to one of ordinary skill in the art at the time of invention to update the error compensation coefficients to ensure that the error has been fully and properly compensated through all the channels. The combination of Applicants' background of invention and Posti does not disclose that there is a period associated with updates of error compensation coefficient. However, as explained above, there is always a period associated with updates, which shows how often the coefficients should be updated.

As to claim 7, Applicants in the background of invention further disclose d-l) generating a digital error compensation signal (see Fig. 1, block 104) to be injected (see block 105 and page 7) to a channel in order to estimates a transfer function of an array transmitting means in the adaptive array antenna system; d-2) generating digital transmitting data by adding the sum data from step c) and the digital error compensation signal from the step d-l (see block 105); d-3) estimating the error compensation coefficient by considering a relation between the frequency down converted signal and the digital error compensation signal (see block 106); and d-4) multiplexing the digital transmitting signal form the step d-2) and a reverse of the error compensation coefficient from the step d-3 (see block 107 and page 1, first paragraph).

As to claims 4 and 10, Applicants in the background of invention disclose that the error compensation coefficient is a transfer function of the array transmitting means (see page 7, lines 32-33).

Conclusion

4. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad Ghayour can be reached on 571-272-3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Leila Malek
Examiner
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